

paper "Zur Kenntnis des javanischen Flugfrosches," in the Biologischen Centralblatt, Bd. xxix., Nov. and Dec. 1909, in which he describes the nesting-habits of *Polyypedates reinwardtii*. These present some interesting points of comparison with those of *P. sawagii*. The general economy of the nests is the same, but in *Polyypedates* the protection for the eggs and the source of fluid for the developing embryos are supplied by a stiff foamy substance instead of by empty egg-capsules (though Siedlecki states that empty egg-cases are often laid). This substance is distinct from the oviducal egg-membranes, which are embedded in the frothy mass, the whole being suspended in leaves as in *Phyllomedusa*. The majority of the eggs are in the centre of the mass, the outer layers containing comparatively few eggs. It is the foamy substance which appears to give up its water to the developing embryos, like the empty egg-cases in *P. sawagii*. After hatching, the tadpoles remain for twenty-four hours or more in the fluid thus obtained, which now lies in the interior of the hollow nest formed by the dried outer layers of the frothy mass. The tadpoles are finally freed by the giving way of the wall of the nest under the softening influence of the fluid inside, or of rain, or of both.—Jan. 1910.]

4. Marine Fauna from the Mergui Archipelago, Lower Burma, collected by Jas. J. Simpson, M.A., B.Sc., and R. N. Rudmose-Brown, B.Sc., University of Aberdeen: MADREPORARIA. By RUTH M. HARRISON and MARGARET POOLE*.

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(Plates LXXXV. & LXXXVI.†)

The collection was made during the spring of 1907, and entrusted to us for identification and description by Professor Bourne. It contains one species of Turbinolidæ, one species of Flabellidæ, two species of Fungiidæ, and ten species of Eupsammiidæ including one new species of *Balanophyllia*.

We wish to take this opportunity of thanking Dr. Bourne for much help and advice, Professor Herdman for the loan of two species of *Balanophyllia*, and Professor Jeffrey Bell for permission to examine the Eupsammiidæ in the National Collection; also Dr. E. H. J. Schuster and Mr. Robinson for the photographs on Plate LXXXV.

Family TURBINOLIDÆ Milne-Edwards & Haime.

By MARGARET POOLE.

The collection contains 84 specimens of superficially very different appearance, but Gardiner has recently shown [16] that

* Communicated by Prof. G. C. BOURNE, D.Sc., F.Z.S.

† For explanation of the Plates see p. 912.

we are really dealing, not with several, but with a single species which is highly variable.

Genus HETEROCYATHUS Milne-Edwards & Haime.

HETEROCYATHUS *ÆQUICOSTATUS* Milne-Edwards & Haime [24].
(Plate LXXXV. figs. 1 a-1 f.)

Stephanoseris rousseaui Milne-Edwards & Haime [27].

H. philippinensis Semper [34].

H. parasiticus Semper [34].

H. pulchellus Rehberg.

H. oblongatus Rehberg.

H. æquicostatus Gardiner [16].

The above list of synonyms of *H. æquicostatus* is due to Gardiner [16], with the exception of *Stephanoseris rousseaui* which was subsequently added by Bourne [5].

The specimens fall into three main types, of which two are identical with those described and figured by Gardiner [16]; while the third is rather markedly different and resembles more closely the figure given by Semper of his now abolished species *H. philippinensis*. The accompanying photographs (Pl. LXXXV. figs. 1 a-f), however, show that this type is connected with the second type of Gardiner by beautifully intermediate forms.

All the specimens are free with smooth bases, and have the aperture of the Aspidosiphon chamber well at one side and often on a slight protuberance.

Type I. 49 specimens. The corallum is pear-shaped, 14.5 × 10.5 mm. and 6 mm. in height. Lateral pores are confined to the basal surface. The costæ are equal in number to the septa, very clearly defined and extending well round on to the basal surface. They are closely covered with small granules. The septa form four cycles of six systems; the primaries and secondaries are the largest and equal in size, the quaternaries come next in size, the tertiaries being the smallest. Crenulated pali stand before all the septa except those of the third cycle, and are indistinguishable from the inner edges of the septa on one hand and from the columellar trabeculæ on the other. Both pali, trabeculæ and septa are covered with spiniform granules. The calicular fossa is hardly 1 mm. in depth, and 2 × 3 mm. in diameter owing to the crowded pali.

Type II. 22 specimens. The corallum is pear-shaped or round, of the same size as type I., but generally slightly taller, 8 mm. The lateral pores are distributed in an irregular manner round the lower part of the wall of the corallum and not restricted to the base as in type I. Costæ as in type I., but tending to be less regular in size. The septa are in four cycles of six systems, but here the primaries are clearly marked off from the secondaries by their greater prominence and larger size, and form, together with their adjacent quaternaries, a well-defined six-rayed star, alternating with the points of which the secondaries with their

quaternaries form a similar though less conspicuous figure. The third cycle is here also the least developed. There are three crowns of pali, which are usually well marked off from the septal margins and the columellar trabeculae; both pali and trabeculae are covered with spiniform granules. The columella lies well below the calicular margin, so that in this type there is a distinct though narrow fossa. Intermediates between types I. and II. show less obvious star figures, and the gradual reduction of the pali and consequent development of the well-defined calicular fossa.

Type III. 13 specimens. The corallum is oval or round, 15 mm. in diameter and 10 mm. high, and somewhat compressed in the middle. The lateral pores form an irregular ring a little below the calicular margin. The costae are as in the two previous types. The septa form five cycles of six systems, of which the primaries and secondaries are very much exsert round the margin and the remaining cycles of about equal size, except those members of the fifth cycle on either side of the primaries and secondaries which are slightly enlarged. There are four crowns of nodular pali clearly marked off from the septa and standing well above the trabecular columella; all are ornamented with spines. The fossa is large, 5×3 mm. and 2 or 3 mm. deep. Intermediate forms connecting this type with type II. have an incomplete fifth cycle of septa, or all the quaternaries are very much reduced so as to be hardly visible.

Localities.—All three types occur at Station XXX. Fly Island, Observation Island, and S.W. of Domel Island. Bottom: rock and sand. Depth: 8-15 fathoms. 48 specimens of type I., 18 of type II., 7 of type III.

Station XXXIII. Christmas Island Group. Bottom: rock, sand, and mud. Depth: 8-23 fathoms. 1 specimen of type I.

Family FLABELLIDÆ Bourne [5].

In the present collection there are 29 specimens of the genus *Flabellum*, which, since Gardiner's [15] revision of the group, can all be included in the highly variable species *F. rubrum*.

Genus FLABELLUM Lesson.

FLABELLUM RUBRUM Quoy & Gaimard.

F. variabile Semper [34].

F. stokesi

F. oweni

F. aculeatum

F. spinosum

F. debile

F. sumatrense }

Milne-Edwards & Haime [27].

All the specimens are free, but with large and clearly defined basal scars. They are truncate in form, the height of the corallum being in all cases less than the length of the calice. The margin of the calice is entire, the ends of the long axis are

from 2 to 10 mm. below the sides, and the latter may be straight, convex, or slightly concave. The corallum is completely covered by an epitheca marked by slight vertical ridges and horizontal concentric lines of growth. There is almost always a root-like process at either end of the basal scar, and often one or two pairs nearer the calice. The septa, which are somewhat exsert round the calicular margin, form generally five cycles of six systems; in some the fifth cycle is incomplete. The primaries, secondaries, and tertiaries are equal in size, with their inner edges slightly thickened and sinuous before they unite by means of thick nodular trabeculae to form the loose parietal columella. Occasionally two or three of the quaternaries are similarly thickened and united with the columella. All the septa are ornamented with radiating ridges bearing small spines.

Localities and the relation between the height of the corallum and the calicular and basal measurements, with the variation in the number of root-like processes of the epitheca, are given in the accompanying table.

Flabellum rubrum.

No. of specimens.	Locality.	Height of Corallum in mm.	Calice in mm.	Basal scar in mm.	Number of basal processes.
1	Station XXV. Gregory Group. Bottom: stones and broken shell. Depth: 4-14 fathoms.	27	29 × 12	8 × 4	4
2	Station XXV. Gregory Group. Station XXIV. Cat Island. Bottom: rock, sand, and broken shell. Depth: 8-22 fathoms.	25	35 × 10	11 × 5	2
2	Station XVI. Alligator Rock. Bottom: rock and sand or mud. Depth: 8-18 fathoms. Station XVIII. Paye Island. Bottom: sand, shell, and rock. Depth: 10-21 fathoms.	19	22 × 10	8 × 4	2
3	Station XVIII. Paye Island.	17	22.5 × 7	8 × 4	2 or 4
6	Station XVIII. " "	16	23.5 × 8	8 × 4	2, 4 or 6
4	Station XVIII. " "	15	19.5 × 7.5	8 × 4	2 or 4
5	Station XVIII. " "	14	20 × 8	8 × 3	2
2	Station XVIII. " "	13	17 × 7.5	9 × 3.5	2
3	Station XVIII. " "	12	18 × 7	9 × 4	2
1	Station XVIII. " "	10	12 × 6	10 × 4	—

Family FUNGIIDÆ (Milne-Edwards & Haime).

Genus FUNGIA Lamarck.

FUNGIA FUNGITES Linnæus.

Var. AGARICIFORMIS Döderlein [7].

Fungia agariciformis Lamarck.

Fungia tenuifolia Milne-Edwards & Haime [26, 27].

Fungia repanda Milne-Edwards & Haime [26, 27].

Fungia linnæi Milne-Edwards & Haime [26, 27].

Madrepora fungites Forskål.

Döderlein [7] identifies *F. fungites* var. *agariciformis* with *F. agariciformis* and *F. tenuifolia*, and *F. repanda* with *F. linnæi*. Milne-Edwards [27], however, gives *F. repanda* as synonymous with *Madrepora fungites* and *F. agariciformis*, and *F. linnæi* also with *M. fungites*; while *F. tenuifolia* he identifies with *F. agariciformis*. The descriptions given by Milne-Edwards of these species show no marked differences beyond those one would expect in a form which Döderlein has shown to be highly variable, and they should therefore, I think, be absorbed into *F. fungites*.

There are in the collection two adult and three young specimens, the latter having well-developed peduncles and being of irregular shape, flat or sometimes slightly concave above. They measure from 30×22 mm. to 64×63 mm. The two adult specimens are concave below and arched above to a height of 38 mm. in the centre. They measure 110×98 mm. The scar of attachment is just to be distinguished.

Localities.—Station XXIX. High Peaked Island. Bottom: coral-reef. 3 young specimens. Locality of adult specimens is unrecorded.

Genus DIASERIS Milne-Edwards & Haime.

DIASERIS DISTORTA Michelin. (Plate LXXXV. figs. 2 *b*, 3 *a*.)

Fungia distorta *Diaseris*-form of Döderlein [7].

Bourne [5] has already criticised Quelch's [33] opinion that this species is really nothing more than abnormal specimens of *Cycloseris* (*Fungia*), and shown that broken and repaired forms of the latter differ very markedly from *Diaseris*. Döderlein, however, says that he finds *Cycloseris*-form specimens of *Diaseris distorta*, and Vaughan [37] describes a specimen of *Cycloseris* from the Philippines which had "several sharply indented lines radiating from the base." "This specimen," he says "looks as if its division in *Diaseris* segments had been initiated, but the process not completed. The segments have remained attached, but indications of the arrested division still persist. There are suggestions in some of the other specimens of lines along which division might take place." He also says that while handling a specimen of *D. pulchella* which was circular, a segment broke out; and therefore he considers *Diaseris* inseparable from *Fungia*.

Nevertheless, I think more evidence is necessary before uniting a form with so peculiar a method of reproduction as *Diaseris* with the genus *Fungia*. Plate LXXXV. figs. 2 *a*, *b*, 3 *a*, *b*, show a photograph of a specimen of *Fungia cyclolites* from the Ceylon collection described by Bourne [5], which has been broken and repaired, and for comparison a specimen of *Diaseris distorta* with two segments.

The collection includes one specimen measuring 30×27 mm. and 20×18 mm., and a few fragments.

Locality.—Station XIII. Maria Island. Bottom: rock and sand. Depth: 8–10 fathoms. One specimen.

Family EUPSAMMIIDÆ Bourne [5].

By RUTH M. HARRISON.

Genus BALANOPHYLLIA Searles Wood.

BALANOPHYLLIA SOCIALIS Semper [34].

Rhodopsammia socialis Semper.

Six examples, of which the largest measures exactly 30 mm. in height, calice 10×8.5 mm., depth of calice 8 mm.; the smallest is but 10 mm. high, with a nearly circular calice, 6×5.5 mm., and 3.5 mm. in depth. The largest specimen shows two lateral scars, one about halfway up the corallum, and the other on the opposite side at a quarter of the entire length from the lip of the calice. Another specimen has two small swellings, the beginnings of lateral buds on opposite sides immediately below the lip of the calice, and below these again on one side is the old scar of a former bud, and on the other is a large lateral bud nearly as large as the parent zooid, and having itself two very fresh lateral scars. The remaining four specimens are obviously young individuals, the two smaller have such very freshly-made basal scars as to suggest that they may have been artificially broken off.

Table of measurements in mm.

	<i>Height.</i>	<i>Calice.</i>	<i>Depth of calice.</i>
1	30	10×8.5	8
2 <i>a</i>	26	12×10	9.5
2 <i>b</i>	22	11×9	8
3	18	8.5×7	5
4	17	8×6.5	5
5	16	8×7	5
6	10	6×5.5	3.5

The table of measurements illustrates the fact pointed out by Semper, that in the young individuals the calice is circular, and the tendency to become oval increases with the age of the individual. The columella is but poorly developed in very young

individuals, becoming more pronounced in older specimens. In all other characters the Burmese specimens agree very exactly with Semper's and Bourne's descriptions of those from the Philippines and Ceylon.

Locality.—Station IX. Bentinck Island and Court's Island. Bottom : sand and shell. Depth : 12–26 fathoms.

BALANOPHYLLIA STOKESIANA Milne-Edwards & Haime.

Leptopsammia stokesiana M.-Edw. & H. [25].

Four individuals undoubtedly belonging to this species. The resemblance in general form and mode of growth is borne out in detail in the characters of the costæ and septa. The columella is rather less developed than in the Philippine species, but projects upwards in the calicular fossa.

Locality.—Station XXII. Hastings Harbour. Bottom : rock and sand. Depth : 3–20 fathoms, and shore.

BALANOPHYLLIA PROFUNDICELLA Gardiner [14].

Three specimens which, with much hesitation, I refer to this species, as they do not appear to differ sufficiently from the description of the type-specimen to justify the creation of a new species.

Table of measurements in mm.

<i>Height.</i>	<i>Calice.</i>	<i>Depth of calice.</i>
22	9·5 × 8	6
16	11·5 × 9·5	5·5
14	9 × 7·5	4

In all three examples the corallum is straight and cylindrical, attached by a spreading base. Epitheca absent ; costæ correspond to septa, broad, subequal, and are visible from the base upwards. Calice oval, fossa not very deep, with a well-developed columella which projects upwards slightly, and has a rounded, somewhat dome-like appearance. Septa in six systems of four cycles, with traces of an incomplete fifth cycle. Primaries and secondaries somewhat exsert, but in all three specimens the lip of the calice is more or less broken, and the character is not very obvious. The quaternaries fuse over the tertiaries and again over the secondaries deep down in the calice. The granulations on the septa of the primary and secondary cycles are extremely fine in the tallest of the three specimens ; in the two others the granules have run together to form fine radial ridges ; the edges are entire ; the edges of the septa of the lower cycles are denticulate.

In the shallower calicular fossa and the denticulate edges of the septa of the third and lower cycles, these forms resemble *B. parvula* (Moseley [28]), which, as Gardiner has pointed out, comes very near to the present species ; but the quaternaries are

not prominently exsert as in the 'Challenger' specimen; and as in other respects the Burmese specimens resemble Gardiner's specimen from Lifu, it is better to retain them with this species.

Locality.—Station XXIV. Cat Island. Bottom: rock and sand and broken shell. Depth: 8–22 fathoms.

BALANOPHYLLIA PARALLELA Semper [34].

B. parallela Bourne [5].

There are thirteen examples of this species, varying in height between 9 and 25 mm., and another closely-allied specimen which is notified below.

Table of measurements in mm.

<i>Station.</i>	<i>Height.</i>	<i>Calice.</i>	<i>Depth of calice.</i>
IV.	22	16.8 × 12.5	8
IX.	25	16 × 12	8
IX.	24	17 × 12	8
IX.	22	14 × 11	8
IX.	19	13 × 9.5	6
IX.	19	12 × 9	6
IX.	18	11 × 9	5
IX.	16	11 × 8.5	5
IX.	15	9.5 × 8	5
IX.	11	9 × 7.5	4
IX.	11	9 × 7	4
IX.	9	8 × 7	3
XXV. & XXVI. ...	23	17 × 13	8
XXII.	26	15 × 11	6

The costæ are not quite so clearly defined in the upper portion of the corallum, but it is possible to trace one in connection with each septum; in the lower part of the colony they are very distinct and identical with those of the Ceylon specimen. The septal characters are similar in every particular.

Localities.—Station IV. King Island. Bottom: rock and sand. Depth 8–25 fathoms. 1 dead specimen.

Station IX. Bentinek Island and Courts Island. Bottom: sand and shell. Depth: 12–26 fathoms. 11 specimens.

Stations XXV. & XXVI. Gregory Group. Bottom: stones and broken shell. Depth: 4–14 fathoms. 1 specimen.

Another specimen resembles *B. parallela* so closely that it seems advisable to place it with that species. The costæ are well defined throughout the entire length of the corallum, in this resembling the Ceylon specimen; but the costæ corresponding to the septa of the first two cycles are slightly larger and more exsert; this is more obvious on one side of the individual than the other. The columella is compressed from side to side, and

projects upwards as a long narrow ridge. Other septal characters are identical with those of *B. parallela*.

Locality.—Station XXII. Hastings Harbour. Bottom: rock and sand. Depth: 3–20 fathoms and shore.

BALANOPHYLLIA IMPERIALIS Kent [19]. (Plate LXXXVI. figs. 5 a, b, & c.)

Two examples, one attached, the other broken off from its attachment. Corallum straight, conical, one specimen increasing in width much more than the other. Transverse outline of calice elliptical, ends of long axis depressed.

Table of measurements in mm.

<i>Height.</i>	<i>Calice.</i>	<i>Depth of calice.</i>
26	20 × 14	7
23	14 × 10.5	5

An “epitheca” covers the lower half of the broader specimen and three-quarters of the narrower one; both were covered by encrusting Polyzoa and *Serpula* tubes. Costæ exactly corresponding to and continuous with all septa; in some cases the junction of the fifth to the fourth cycle of septa is marked externally by a corresponding junction of the costæ. All costæ slightly, but very distinctly, and equally exsert, the upper edges where they pass into the septa rounded and entire; granulations coarse, having the appearance of longitudinal rows of small spines. Septa in five absolutely complete cycles, all covered irregularly with numerous fine granulations; septa of the first two cycles equal in size, reaching the columella, at which point they are thickened; edges of these septa, also the upper half of the septa of the third cycle, entire; septa of the third cycle also reach the columella, and are thickened at the point of junction, lower edges denticulate; septa of the fourth and fifth cycles grouped in typical Balanophyllid manner round septa of the third cycle; edges denticulate. Calicular fossa large and moderately deep. Columella well developed, trabecular and spongy, with a convex surface.

Localities.—Station XVIII. Paye Island. Bottom: sand, shell, and rock. Depth: 10–21 fathoms. The larger specimen.

Station XXII. Hastings Harbour. Bottom: rock and sand. Depth: 3–20 fathoms. The smaller specimen.

I refer this very beautiful coral to the species from Singapore in the National Collection described by Saville Kent [19], in spite of the following differences: the great difference in size, the larger of the specimens in the present collection is only half the size of the one from Singapore; the erect mode of growth; the presence of an epitheca; the rougher, more spinose character of the costæ. However, none of these difficulties need be insuperable.

Size is obviously a character which must vary, and within certain limits cannot be regarded as a distinction between species; shape must necessarily be determined to a great extent by local external conditions, concerning which there is no information; the "epitheca" of the Burmese specimens may possibly have been formed secondarily in self-preservation from the encrusting parasites which surround the lower portion of the corallites, and may not be a true epitheca at all; and the costæ of these smaller and probably younger individuals have not yet become so smooth and worn as those of the larger Singapore specimen.

The absolute symmetry of the internal structures, the characters of the septa, and their entire edges passing into the costæ, sufficiently establish its identity.

BALANOPHYLLIA DIFFUSA, sp. n. (Plate LXXXV. figs. 4 a & b.)

Two examples, both broken from their attachment; slightly curved, with slight circular swellings visible externally at various heights. Transverse outline of calice elliptical, lip of calice not thickened.

<i>Height.</i>	<i>Calice.</i>	<i>Depth of calice.</i>
25	13 × 9	3
20	12·5 × 10	3

Epitheca absent. Costæ visible from the base upwards, but not exsert, rather broad, and beset with low granulations; the junction of the fifth to the fourth cycle of septa is, in some cases, accompanied by a corresponding junction of the costæ externally. Septa in six systems of four cycles, with an incomplete fifth cycle; septa of the first two cycles equal, somewhat exsert, edges smooth and entire, slightly thickened peripherally, and inclined to become fenestrated; granulations tend to run in longitudinal and radial rows; septa of the lower cycles arranged in typical *Balanophyllid* manner, edges very irregular and denticulate. Calicular fossa shallow. Columella very highly developed, of a very delicate spongy trabecular texture, and in some places extending between the septa of the first two cycles up the septa of the third cycle to the junction of the third to the fourth cycles. This encroachment of the columella on the interseptal chambers is a character quite distinct from any previously described species.

Locality.—Station XXII. Hastings Harbour. Bottom: rock and sand. Depth: 3–20 fathoms and shore.

Genus *HETEROPSAMMIA* Milne-Edwards & Haime.

HETEROPSAMMIA MICHELINI Milne-Edwards & Haime [25].

Numerous specimens, 322 in all, from different stations, varying in size between small individuals 7 mm. in height, with calices 7 × 5 mm., to forms twice the size, 15 mm. high, and calices 13 × 9 mm. The great majority have two calices, or else the

typical figure-of-8 form of two individuals in the process of dividing. The joining of the septa of the fifth cycle over those of the fourth is decidedly marked. At the point where the junction takes place the single septum formed by the union of the two septa of the fifth cycle becomes strongly convex, as Milne-Edwards has already pointed out, and the lower half projects inwards towards the columella beyond the septa of the first three cycles.

Localities.—Station VI. Near Grant Island. Bottom: rock and sand or rock and mud. Depth: 3-7 fathoms. 14 specimens.

Station XXX. Fly Island. Bottom: rock and sand. Depth: 8-15 fathoms. 307 specimens.

Station XXXIII. Christmas Island. Bottom: rock, sand, and mud. Depth: 8-23 fathoms. 1 specimen.

Genus DENDROPHYLLIA Milne-Edwards & Haime.

In the present collection there are three species of Colonial Madreporaria which have points in common with Milne-Edwards and Haime's original three genera *Dendrophyllia*, *Cænopsammia*, and *Lobopsammia*, and the difficulty of deciding to which they belong is such that it will probably be convenient in the future to recognize but one genus instead of three. In the original diagnosis of the genus *Cænopsammia* by Milne-Edwards and Haime, the close connection between the three genera was pointed out; but *Dendrophyllia* and *Lobopsammia* are distinguished from the former by the star-like appearance of their calices (l'aspect étoilé des calices). Klunzinger has remarked on the same difference; speaking of *Cænopsammia* he says:—"Daher ist hier auch das für die Familie charakteristische Zusammenlaufen der kleineren Septa hier nicht oder wenig ausgesprochen (zum Unterschied von *Dendrophyllia*)."

Cænopsammia has only three complete cycles of septa; *Dendrophyllia* and *Lobopsammia* have four complete cycles. *Lobopsammia* propagates by fissiparity; both *Dendrophyllia* and *Cænopsammia* propagate by gemmation. Verrill has already placed *Cænopsammia* with *Dendrophyllia*, and in this has been followed by most subsequent authors, and the specimens in this collection not only justify this conclusion, but make it seem advisable to include *Lobopsammia* in one and the same genus with *Cænopsammia* and *Dendrophyllia*. The species I identify as *Dendrophyllia coccinea* (*Cænopsammia coccinea* M.-Edw. & H.) in general appearance and mode of growth is very like *C. tenuilamellosa* and *C. ehrenbergiana* (M.-Edw. & H. [25. pl. i. figs. 11 & 12]), and Wayland Vaughan's figure (37. pl. xlvi. figs. 6 & 6 a) of Verrill's original specimen of *Dendrophyllia manni* (*Cænopsammia manni* Verrill). The septal arrangement is very dendrophyllid in character, the star-like appearance caused by the union of the fourth to the third cycle of septa about halfway between the lip of the calice and the columella being pronounced. The septa are so irregular as regards both cycles and systems that they afford no certain guide. In the smaller colony of the East African species there is one individual with a complete fourth cycle (*Dendrophyllia* and *Lobo-*

psammia) fig. 7 a; another individual with an incomplete fourth cycle (*Cænopsammia*) fig. 7 b; while a third individual which has lately become separated off has not even the typical six systems of cycles, fig. 7 c, but four complete cycles of four systems. In the larger colony is an individual which clearly proves that new zooids are formed by fission and not by gemmation (*Lobopsammia*), fig. 7 d; for here the lip of the calice has been drawn out into an oval, a strong ridge has grown across the centre, and the two individuals are incompletely separated; the septal systems are incomplete in both, but four systems can be distinguished in one and two in the other. A comparison of this figure (fig. 7 d) with fig. 7 c throws a light on the interpretation of the septal arrangement of the latter; the ridge that has grown across the double calice divides it into two unequal parts. The larger part contains four nearly complete systems of four cycles, and it is here possible to trace rudiments of the two remaining systems, which will ultimately complete the typical zoantharian six systems; but in the other part, where only two systems of four cycles are discernible, it is possible that the six systems will never be complete, and that this has actually occurred in the individual represented in fig. 7 c. The process of fission has not gone far enough in the double-caliced individual to decide that each zooid will ultimately have its full complement of septal systems, and it has gone too far to be certain that the dividing-ridge has grown, not across the middle but rather across one end of the calice; nevertheless, considering the arrangement of the septa of the zooid represented in fig. 7 c, it seems probable that this has been the case, and that this represents four cycles of four systems rather than three cycles of eight; for it is easier to believe that an individual which has been formed by a process comparable to simple binary fission will have a shortage rather than an excess of the normal complement of characters.

From the above discussion it is clear that this species from the Mergui Archipelago breaks down Milne-Edwards and Haime's original generic characters for the three genera *Dendrophyllia*, *Cænopsammia*, and *Lobopsammia*; and the same is true of *Dendrophyllia robusta* (*Lobopsammia robusta* Bourne). Of the three colonies in the Burmese collection, one does not differ in any particular from the original Ceylon specimen, but in both the others it is quite obvious that new individuals are not formed by fission. One of these colonies is represented in fig. 6, but whether the youngest zooid has been formed by gemmation or by the process described and figured by von Koch (20. pl. iii. fig. 21) as "Theilkospung," it is not possible to decide from the material available; but the fact that it has not been a process of fission breaks down an important generic character that separated *Lobopsammia* from *Dendrophyllia* and *Cænopsammia*.

The remaining colonial form appears to be *Dendrophyllia gracilis* (M.-Edw. & H.) and offers no special feature that bears on the present argument.

DENDROPHYLLIA COCCINEA M.-Edw. & Haime. (Plate LXXXVI. figs. 7 a, b, c, d.)

Cænopsammia coccinea M.-Edw. & Haime.

Two small colonies, one consisting of but four individuals, the other of eleven. Colonies 10 to 20 mm. high respectively, individual corallites rising from 2 to 6 mm. from the general corallum. Costæ well-marked on individual corallites, but lose definition on the general corallum, coarsely covered with granulations. Lip of calice nearly circular, not thickened. The columella is small and is joined by the septa of the first two cycles. Septa in four cycles of six systems, but the systems are very irregular and have already been detailed in the discussion on the genus. Septa of the first two cycles beset with longitudinal rows of conspicuous granules and having irregular somewhat denticulate inner edges; those of the third and fourth cycles are porous and highly denticulated at their inner edges.

Locality.—Station XXIV. Cat and Kitten. Bottom: rock, sand, and broken shell. Depth: 8–22 fathoms.

It is not without much hesitation that I identify this species as *Dendrophyllia coccinea* (*Cænopsammia coccinea* M.-Edw. & Haime). The last-named authors have noted the similarity between *C. coccinea*, *C. ehrenbergiana*, and *C. gaimardi*, also between *C. urvillii* and *C. tenuilamellosa*. Klunzinger [21] does not distinguish between *C. coccinea* and *C. ehrenbergiana*: the species in question from Burma, bearing as it does points of similarity with both these and also with *C. tenuilamellosa*, suggests that all the above-mentioned five species are varieties of one variable species.

In general appearance, septal arrangement, and the irregularity of the orders of septa the Burmese species resembles *C. tenuilamellosa*, but differs from it in having a very much reduced columella and septa covered with coarse granules; in these characters it resembles *C. coccinea*, but the granules of the septa of the latter are described as very small, which can hardly be said of the species under discussion. Klunzinger has remarked great variability in the development of the columella in individuals of the same colony, and therefore discounts it as a distinguishing specific character.

The Burmese species is intermediate between *C. coccinea*, *C. ehrenbergiana*, and *C. tenuilamellosa*; I therefore give it the generic and specific names that have priority—*Dendrophyllia coccinea*.

DENDROPHYLLIA ROBUSTA Bourne. (Plate LXXXVI. fig. 6.)

Lobopsammia robusta Bourne.

Three colonies, all considerably smaller than the original specimen described by Bourne, but, as has been already suggested in a previous part of this paper, size cannot be regarded as a character of any specific importance. The largest calice of the Burmese specimens measures 12 × 8 mm., the smallest 5.3 × 5 mm.; and

the columella in no individual is as pronounced as that of the Ceylon specimen [5. pl. ii. fig. 10 *a*]; but as it is so much reduced as to be practically non-existent in the youngest individual, and considerably more developed in older individuals, the fact that it never reaches the dimensions of that in Bourne's figure may be due to immaturity.

Localities.—One colony from Station XVIII. Paye Island. Bottom: sand, shell, and rock. Depth: 10-21 fathoms.

Two colonies from Station XXIV. Cat Island. Bottom: rock, sand, and broken shell. Depth: 8-22 fathoms.

DENDROPHYLLIA GRACILIS Milne-Edwards & Haime.

A single individual 12 mm. high, and two young colonies 17 and 19 mm. high, consisting of three and four individuals respectively. The calices of the younger individuals are practically spherical; the columella rises very slightly in the calicular fossa, and in the solitary specimen it is compressed and narrow from side to side. The septa of the first two cycles are not denticulate, but in all other respects it is identical with M.-Edwards and Haime's description.

Locality.—Station XXIV. Cat and Kitten. Bottom: rock, sand, and broken shell. Depth: 8-22 fathoms.

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EXPLANATION OF THE PLATES.

PLATE LXXXV.

- Fig. 1 a. *Heterocyathus æquicostatus* M.-Edw. & Haime. Type I.
- 1 b. " " " Type II.
- 1 c. " " " Type II. approximating type III.
- 1 d. " " " Type III. with four cycles of septa.
- 1 e. " " " Type III. with incomplete fifth cycle of septa.
- 1 f. " " " Type III. with five complete cycles of septa.
- 2 a. *Fungia cyclolites*. Upper surface of broken and repaired specimen.
- 2 b. *Diascris distorta* Michelin. Upper surface of specimen with two segments.
- 3 a. " " " Under surface of the same specimen.
- 3 b. *Fungia cyclolites*. Under surface of 2 a.
- 4 a. *Balanophyllia diffusa*, sp. n. Lateral view of the corallum.
- 4 b. " " " Diagram of the septal arrangement.

PLATE LXXXVI.

- Fig. 5 a. *Balanophyllia imperialis* Kent. Lateral view of the corallum.
- 5 b. " " " Diagram of the septal arrangement.
- 5 c. " " " A single system of septa.
6. *Dendrophyllia robusta* Bourne. Lateral view of a colony.
- 7 a. } *Dendrophyllia coccinea* M.-Edw. & Haime. Diagram of the septal arrangement in three different individuals.
- 7 b. }
- 7 c. }
- 7 d. " " " The calice of an individual in the process of dividing, viewed from above.